Available online at www.sciencedirect.com
ScienceDirect
Renewable and Sustainable Energy Reviews 13 (2009) 208–215
RENEWABLE & SUSTAINABLE ENERGY REVIEWS
www.elsevier.com/locate/rser

Towards an international tradable green certificate system—The challenging example of Belgium

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Received 30 November 2006; accepted 5 January 2007

Abstract

In Europe, a common framework for renewable energy sources (RES) is aspired. Tradable green certificates (TGCs) are a market-based cost-efficient means to stimulate electricity production from RES. Since TGCs are the most widespread support scheme in Europe together with feed-in tariffs, chances are that a common European framework could well be based on TGCs. However, while integrating currently existing different national TGC systems, any remaining differences should be carefully considered. Just how difficult the creation of an international TGC market would be is illustrated in this paper by the case of Belgium, where no less than 4 different TGC systems exist nowadays. The example of Belgium illustrates that harmonizing different TGC systems is easier said than done and represents a serious challenge. This clearly illustrates that a single European support scheme for RES, however desirable, is still far in the future.

Keywords: Renewable energy sources; Tradable green certificates; Harmonization; Regional differences

Contents

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1364-0321/$ - see front matter
doi:10.1016/j.rser.2007.01.021

1. Introduction

Besides the liberalization process, environmental protection and the Kyoto Protocol make up an enormous challenge for the European energy industry. The enlarged Union (EU-15) has committed itself to reducing the global emission of greenhouse gasses by 8% from 1990 levels in the commitment period 2008–2012. This target was redistributed among the Member States. In order to achieve this goal, the European Union promotes renewable energy sources (RES), combined heat and power (CHP) and energy efficiency on one hand and discourages fuel types with high emissions on the other hand.

With regard to the promotion of RES, ambitious targets were formulated. In a White Paper from the European Commission (EC), it was determined that 12% of gross national energy consumption in Europe should originate from RES by 2010, compared to a level of 6% in 1997 [1]. This target corresponds to 21%[1] electricity produced from RES in total Community electricity consumption. These goals were confirmed in the 2001 RES Directive, together with national indicative targets for the contribution of electricity produced from RES to gross electricity consumption per Member State [2]. Belgium was appointed such a national indicative target of 6% by 2010.

In order to accomplish these goals, support measures for RES are necessary. So far, a European-wide harmonized support scheme has not been enforced. The choice of which support system to adopt is up to each Member State. Nowadays, various sustainable energy policies have been implemented in the different Member States. The costs and effectiveness of the different RES support mechanisms currently applied in Europe and the possibility of support scheme harmonization were recently assessed by the EC [3]. In this report, the EC acknowledges that the overall cost of complying with the RES target could be substantially lower with a harmonized support scheme throughout Europe. Nevertheless, also disadvantages of harmonization are identified and consequently the EC does not regard it appropriate to present a harmonized European system at this stage. It remains in the EC's intent however to develop an RES support scheme on a European level in the long run. By December 2007, the advantages and disadvantages of further harmonization will again be analyzed.

In this paper, the possibility of a single European certificate system to promote RES is evaluated. First, the two main systems applied in Europe to support RES, namely feed-in tariffs and tradable green certificates (TGCs) combined with quota obligations, are described. Next, this paper demonstrates the need to expand a TGC systems' borders when such a system is chosen. Finally, the European Union's ambitions for a European-wide harmonized support scheme are contrasted with the current situation in Belgium, where no less than four different TGC systems exist. This clearly illustrates that a single European support scheme for RES, however desirable, is still far in the future.

[1]The initial target defined in the Directive of 22.1% for the EU-15 has become 21% for the enlarged Union (EU-25). National indicative targets for the 10 new Member States are included in the Accession Treaty.

2. RES support schemes: TGC versus feed-in tariffs

Nowadays, different support systems have been implemented throughout Europe. The most widespread are feed-in tariffs and TGC systems [4,5]. The former implies guaranteed long-term minimum prices for sustainable electricity. Network operators are obliged to purchase electricity produced from RES in their area at this minimum price. Consequently, the feed-in tariff operates as a subsidy allocated to producers of RES. This way, a long-term stable price structure is provided, overcoming an important part of the market risks. On top of that, in many countries a feed-in tariff is combined with an exemption of balancing costs for green producers. This allows sustainable energy producers to refrain from complete market participation. In Germany and Austria for example, balancing costs are included in the transmission network tariffs and thus paid by all consumers who happen to be connected to those grid-companies which also have a lot of wind power [6]. Feed-in tariffs have proved to be superior in promoting wind power, e.g., in Denmark, Germany and Spain [7,8]. However, such a system can become a rather heavy burden on the public budget [9]. Moreover, it does not provide producers of sustainable energy with an incentive to work cost-efficiently.

The second widespread support mechanism for RES in Europe are TGC combined with a minimum quota obligation. In such a system, demand for TGCs is stimulated by obliging the end-users to guarantee that a certain share of their electricity, imposed by the quota obligation, was produced using RES. However, for practical reasons this obligation is usually not imposed on consumers but on electricity suppliers or distribution companies. Every year these market participants have to hand in sufficient TGCs in order to prove that they have met the quota obligation. For each missing TGC a fine has to be paid. Supply of TGC is created by issuing them to sustainable energy producers. Consequently, a supplier or distribution company with a quota obligation can obtain the required amount by buying them from a sustainable energy producer or by producing sustainable energy himself.

Such a TGC system introduces market mechanisms and trade in sustainable energy production and integrates it into the liberalized internal electricity market. The generated electricity and its quality identification, in the form of a certificate, are detached at the point of generation and traded separately. A distinct market for the environmental value is created.

Sustainable energy producers receive an extra allowance for their investment, in addition to the market price of the produced electricity, namely the market price of the certificate. This way, RES technologies are at least partly

compensated for the environmental benefits they provide [9]. Additionally, investment decisions are made in accordance with market-based values; that of electricity on one hand and of TGCs on the other. Moreover, the price paid for a TGC on the market is independent of the production cost. Therefore, producers are given an incentive to work cost-efficiently. Clearly, when the goal is to achieve a quota obligation, a TGC system, if implemented properly, is not a bad choice. It should be noted that the certainty of feed-in tariffs can be integrated in such a system by offering sustainable energy producers a guaranteed minimum price for their certificate.

3. The need to expand the borders of a TGC system

A problem arising when implementing a TGC system is that the TGC price can be expected to fluctuate significantly, which has a negative impact on investments [7]. In case of a TGC shortage, their price will be very high. The price will fall to a very low value when there is a surplus. These fluctuations are due to the lack of liquidity when the market is limited [8,9].

This problem may be (partly) resolved by a futures market with long-term contracts or by allowing borrowing and banking. Another way of resolving this issue could be the creation of floor and ceiling prices [8]. A floor price would imply the purchase of TGCs by the regulator at a guaranteed minimum price. A ceiling price may be needed in case of a shortage of certificates, and will be attained by defining a penalty price that has to be paid in case of insufficient certificates. If the TGC prices exceed the penalty, consumers will prefer being fined rather than buying certificates. Nevertheless, in case the market is limited the TGC price will still land at one of these two values, creating an uncertain situation for investors. National markets are likely to remain too small for the creation of price stability. As a result, the establishment of an international trade of TGCs seems to be the most suitable method to stabilize TGC prices. The larger market will function as a buffer towards short-term fluctuations in the supply or demand of certificates.

Another significant advantage of a European market is the expected cost-effectiveness: renewable plants will be situated at the most suited locations where resources are available [9]. Nowadays this advantage is opposed by the calculation method of the national indicative targets per Member State. These are based on the national production of energy from RES divided by the gross national electricity consumption [2]. These targets are "soft" and the RES Directive mentions that in case of internal trade of energy from RES, the indicative targets per Member State will be influenced but not the Community total. However, in practice each country aims at reaching its own target. Consequently, maintaining domestic production targets per country will result in market corrections that will prevent a European-wide trade from working effectively. Instead, consumption targets per country seem a better option. Then, suppliers can either obtain the necessary TGCs by producing energy from RES themselves, or by buying TGCs abroad. This way, energy from RES will be produced where this is the most effective. Especially from the point of view of the Kyoto objective, production targets per country are inefficient since this is a global issue. However, taking into account security of supply and the necessity to decrease Europe's dependence on primary fuels, demanding a certain amount of domestic European RES production is acceptable. Nevertheless, within Europe no production targets per Member State should be imposed since this undermines one of the goals of European-wide TGC trade, namely cost-effectiveness.

4. Moving towards international TGC trade: the challenging example of Belgium

When a TGC system is implemented new functions must be guaranteed, such as the certification of RES producers and the moderation of a register that keeps track of the TGC trade. Quotas must be imposed in such a way that they stimulate investments in new RES generation capacity and incorporate technological development: moderate at first, and then increase gradually [8]. A single TGC for different types of RES is advisable, at least in the begging, since different TGCs for different technologies would lead to different markets with a lack of liquidity [10]. In order to avoid this approach leading to a concentration on the less expensive technologies, countries can use additional R&D support mechanisms [11].

When integrating existing TGC systems into one harmonized system, within a country or on an international scale, substantially more implementation issues should be considered which are discussed in the following section [12,13]. Already in article 4 of the RES Directive, Europe clearly aims at such a European-wide harmonized support scheme for RES [2]. However, it is shown in [10] that significant differences exist between currently implemented support schemes in different countries. Moreover, looking at Belgium as a case study, this section illustrates that even within one country harmonizing different TGC systems is a serious challenge and consequently, European-wide TGC trade is still far in the future.

4.1. The Belgian energy market

Belgium is a federal state consisting of three regions: Flanders, Walloon and Brussels. "Energy" falls under the responsibility of both the federal and the regional authorities for certain matters [14]. The federal authorities are responsible for:

- the national equipment program in the electricity and gas sector,
- electricity generation (power stations),
- electricity transmission (high-voltage lines),

- tariffs,
- nuclear energy.

Regional competences are:

- local distribution of electricity (under 70 kV),
- public gas distribution,
- cogeneration,
- promotion of RES,
- rational use of energy.

As said above, Belgium aims at a percentage of 6% of the total electricity consumption coming from RES by 2010. The amount of electricity which should be produced using RES increases every year since electricity consumption in Belgium has increased over the past 5 years with an average yearly growth rate of 1.5%. Consumption in 2004 was even 2.2% higher than the previous year. This increased consumption resulted in an increase of import of electricity with 0.9%, resulting in 8.9% of the Belgian demand being covered by import [15].

Production in Belgium originated in 2004 for 55.1% from nuclear power plants, 42.8% came from classic thermal plants and 2.1% from hydraulic plants and others, in which the RES are included. Clearly, RES still constitute only a marginal part of the Belgian electricity production [15].

Since sustainable energy is a regional competence in Belgium, TGC systems have been implemented in all three regions for RES. The different regions have chosen to apply different TGC systems. Additionally, since the regions only exercise their competences within the boundaries of the Belgian territory, the territorial waters are a federal competence. Therefore, in addition to the three kinds of different TGCs issued by the regions, federal TGCs will be issued should any production of green power in the Belgian part of the North Sea take place.[2] Consequently, nowadays no less than four different TGC systems for RES exist in Belgium. On top of that, in Flanders a separate TGC system for CHP was created. In Walloon and Brussels, only one type of TGC exists, which is issued for RES as well as CHP.

4.2. Issues on the way towards harmonization

In order for an international TGC system to function, one condition is indispensable: reciprocity, meaning mutual acceptance of other countries' TGCs to fulfil the quota obligation. Today, this condition is not fulfilled in Belgium. Suppliers can only use TGCs issued by a certain region to fulfil their quota obligation in that region. However, TGCs from another region do not apply.

[2]So far, this no offshore wind has been generated in the Belgian part of the Nort Sea, although three projects are in the pipeline. According to project developers, the first offshore wind should be generated in the Belgian Sea by 2007.

Several other differences between TGC systems are to be considered and could be equalized when harmonizing. Allowing differences between regions in the modalities of a harmonized system not necessarily threatens the functioning of the system as such. However, policy makers should take well-considered decisions in this area and be well aware that cross-subsidies resulting from such differences are possible.

4.2.1. Stable markets

A first aspect to consider is the necessity of establishing a stable market which cannot be disturbed by unilateral actions. After all, such changes in quota or penalties can distort the multilateral market. This requirement does not necessarily imply the merger of the different issuing and other responsible bodies into one. Different bodies can work in different areas, as long as they work together in a coordinated way and jurisdictions are divided consistently. In Belgium changes in the modalities of the different TGCs can at the moment unilaterally be taken by the different regulators,[3] each responsible for issuing TGCs in their region.

4.2.2. Timing

A second modality to look at is the time frame of the TGC trade. The periodicity with which TGCs are issued and the deadline for submission can differ across TGC systems. This leads to different peak moments in trade. If this is the case, producers have more opportunities to sell their TGCs throughout the entire year and TGC trade can be smoothened. Differences in deadlines could thus have a positive effect for the market. In Belgium, such differences are present. In Flanders, TGCs are issued monthly and should be submitted once a year, whereas the Walloon system is based on trimesters [16–18].

4.2.3. What is green? The definition of a TGC

Another question to answer is who receives certificates. In other words, a definition of what is regarded as sustainable energy is required. Nowadays in Belgium, the different regions have set different acceptance limits regarding which production installations can receive certificates. In the case of hydro power for example, in Flanders and Brussels only installations with less than 10 MW capacity can apply for TGCs [19]. In Walloon on the contrary, installations of more than 20 MW are accepted, with a maximum number of TGCs equal to the power of the installation divided by 20 [20,21]. It has to be questioned whether these differences can be maintained in a harmonized system. After all, the fairness of a system in which a Walloon producer can sell a TGC in Flanders,

[3]The Belgian federal regulator CREG (Commissie voor de Regulering van de Electriciteits- en Gasmarkt), the Flemish regional regulator VREG (Vlaamse Reguleringsinstantie voor de Electriciteits- en Gasmarkt), the Walloon regional regulator CWaPE (Commission Wallonne pour l'Energie) and the Brussels regional regulator BIM (Brussels Instituut voor Milieubeheer).

representing a production of sustainable energy for which in Flanders no TGC can be obtained, can be doubted. However, such differences do not necessarily have to be a problem when the acceptance limits are known beforehand and market parties can take them into account when determining their investment site.

4.2.4. Quota and penalties

The next issue to be considered when harmonizing is on one hand the quota obligation, determining the demand for certificates, and on the other hand the fine to be paid in case of TGC shortage. Differences in quota and penalties between countries possibly lead to cross-subsidies and inefficiency. A higher quota obligation in one country obliges end-users to attain a larger amount of certificates. They can do this by either investing in sustainable energy production themselves or by buying sufficient TGCs on the market. The amount of money they are prepared to invest or the price they are willing to pay on the market is determined by the penalty. In a harmonized support system, a high quota in one country will result either in investments in countries where sustainable energy is most efficiently and thus cheapest produced, or in an increased demand for TGCs in those countries with the lowest penalties and consequently the lowest TGC market prices. Consequently, countries with higher quota and penalties could end up stimulating investment and driving up the TGC price in other countries. As a result, prices in the latter could end up being higher than the penalties there. This would lead to end-users in these countries preferring to pay the penalty instead of paying the TGC price. TGC systems in these countries will then be inefficient, since end-users are no longer stimulated to buy TGCs or to invest in green production. The following table illustrates the differences in quota and penalties for 2005 in Belgium (Table 1).

4.2.5. Issuing base

What also should be considered is to what extent technical equivalence of TGCs is required. This regards how much TGCs are issued in exchange for which production of sustainable energy. Nowadays, TGCs on the federal and the Flemish level are issued in exchange for 1 MWh of electrical energy produced from RES [22]. Walloon and Brussels green TGCs on the other hand stand for respectively 456 and 217 kg of CO_2 emission avoided. This can result in differences in the number of TGCs received for producing a MWh of sustainable energy, depending on the CO_2 emission of production technology. Also, the penalty to be paid per missing MWh differs as a result of the differences in issuing base, as illustrated in the following table [13,23] (Table 2).

Table 1
Quota obligations and penalties in Belgium (2005)

	Quota (%)	Penalty (€)
Flanders	2.5	125
Walloon	5	100
Brussels	2.25	75 (2007: €100)

Table 2
Differences resulting from different issuing bases between the Belgian regions

		Flanders	Walloon	Brussels
Wind	# certificates/MWh	1	1	18,182
	Penalty (€/MWh)	125	100	136
Biomass CHP	# certificates/MWh	~0.3	~1.8	~3
	Penalty (€/MWh)	13	179	234

Clearly, the fact that TGCs from different regions represent different efforts makes it impossible to look upon them as being equal and trade them on a one-for-one basis. A related issue is the amount of electrical energy considered for TGC issuing. Differences in the calculation method of this energy amount can exist, jeopardizing even more the comparability of different certificates. In the case of Belgium, this is clearly illustrated by co-combustion installations, where fossil fuels as well as biomass are burned in the same process. In Flanders, such installation is looked upon as 2 separate ones, resulting in TGCs being issued proportional to the percentage of biomass used. In Walloon on the contrary, a co-combustion installation is regarded as one installation, the emissions of which are compared with a reference installation. Most of the time, the latter approach leads to less TGCs being issued for co-combustion.

4.2.6. Additional support mechanisms

A final difference possibly existing in a harmonized TGC system concerns alternative support schemes, determining the minimum TGC price. Such support influences the minimum price producers wish to receive for TGCs on the market and consequently the supply of certificates. It is argued in [10] that additional support mechanisms should be harmonized in order to make the market more simple, transparent and compatible with a liberalized electricity market. However, it is the authors opinion that differences in alternative support do not necessarily lead to major distortions threatening the well-functioning of the market. Instead, they can be a means for the authorities to promote certain technologies and thus to tune the market to the specific conditions in their region. Therefore, it must be guaranteed however that only domestic companies can benefit from additional support provided by a country.

Direct production support in exchange for TGCs and guaranteed minimum prices paid by distribution and transmission system operators are two examples of alternative support schemes currently implemented in Belgium. In Walloon, green producers can choose between receiving a TGC on one hand or a direct production support of maximum €65 from the regional regulator

Table 3
Guaranteed minimum prices of Flemish distribution system operators

Production technology	Price per certificate (€)
On-shore wind energy	80
Hydro energy	95
Solar energy	450
Other RES, including biomass	80

Table 4
Guaranteed minimum prices of Belgian transmission system operator Elia

Production technology	Price per MWh (€)
Off-shore wind energy	90 (future: €107)
On-shore wind energy	50
Hydro energy	50
Solar energy	150
Other RES, including biomass	20

CWaPE on the other hand. Depending on the technology, a higher amount can be provided. The direct production support granted should however never be higher than the additional costs of green electrical energy as compared to the market price. Moreover, the amount of the direct production support is limited by the penalty [21].

In Flanders, the Distribution System Operators (DSOs) offer guaranteed minimum prices per TGC depending on the technology [24] (Table 3).

A similar system exists on the federal level. The Belgian Transmission System Operator Elia is obliged to pay (different) minimum prices per MWh for Flemish, Walloon and Brussels production installations younger than 10 years, also depending on the applied production technology [25] (Table 4).

Elia as well as the Flemish DSOs offer the bought up TGCs back to the market afterwards, trying to at least partly recover their costs. Any remaining difference between the paid minimum price and the received market price is recovered through the transmission respectively distribution tariffs. Besides these guaranteed minimum prices offered by the different regions, a green producer can obviously also choose to offer his TGCs at the regional TGC market.

It should be noted that while the Flemish DSOs offer a guaranteed minimum price per certificate, Elia does so per MWh. This is the consequence of the previously discussed differences in issuing base. After all, in Elia's minimum prices a distinction is made according to the used production technology, but not according to the region that issued the certificate. However, as said above, for some production technologies TGCs from the different regions represent different efforts. Consequently, Elia paying the same amount per TGC for all regions would be unfair. Also the combination of both RES and CHP into one TGC system in Walloon and Brussels poses problems. After all, Elia is obliged to pay guaranteed minimum prices for green certificates. However, in Walloon and Brussels, there is only one TGC system for both RES and CHP, whereas in Flanders two different systems exist. So the question arises whether Elia should buy Walloon or Brussels "green" TGCs that were issued for CHP installations, since Flemish CHP TGCs do not apply for this support.

Another remark to be made with respect to the guaranteed minimum prices in Belgium is that in practice feed-in tariffs are introduced in the system for some technologies. For (federal) offshore certificates, the guaranteed minimum price has been announced to increase from the current €90–107, compared to €50 for TGCs of energy produced in onshore installations. Moreover, offshore wind farms can receive the guaranteed minimum price for 20 years instead of 10. It seems rather strange that offshore installations should receive more support than onshore ones. After all, the main argument for installing wind farms in the sea is the fact that the operation time is higher, offsetting the higher investment cost. Furthermore, in comparison to onshore, offshore wind farms can profit from additional support measures. Firstly, Elia is obliged to pay a third of the cost of the undersea cable, with a maximum of €25 million [26]. On top of that, offshore wind farms receive more preferable tolerance margins in case of unbalance between nominated and actual production. It is defined in Belgian law that production installations using RES and CHP are entitled to such an advantageous tolerance margin [27,28]. In practice, these more preferable margins have not been defined yet, only in the case of offshore wind, which is entitled to a 30% margin instead of the usual 10% [24,26].

Also in the case of solar energy, it can be wondered whether they are in practice supported by TGCs or feed-in tariffs. Currently, Elia offers a guaranteed minimum price of €150 for such certificates, compared to a maximum penalty limiting the market price of €125, to be paid in Flanders. Since 2006, Flemish DSOs even pay a minimum price for PV TGCs of €450. Clearly, all suppliers will hand in their TGCs received for solar energy and none of these TGCs will be offered to the market. On top of that, since photovoltaic installations are regarded as negative load, they do not ex-ante have to nominate their production. Consequently, an unbalance between nominated and actual production cannot occur and solar energy producers are exempted from paying balancing costs.

5. Conclusions

Clearly, the multiple differences existing between the four TGC systems implemented in Belgium make it impossible to integrate into one system without some adaptations. Nevertheless, pressure on the different regulators to work towards such integration is increasing. On December 23, 2004, the supreme administrative court of Belgium decided to remove the article in the Flemish legislation stating explicitly that only TGCs obtained in the

Flemish region or the Belgian sea area can be accepted to fulfil the quota obligation [29]. This restriction, based on origin of the certificate, was seen as an obstruction to the principle of free trade of goods within Belgium. In the new article, published on March 8, 2005, any reference to the origin of the TGCs has been left out [30]. Nevertheless, TGCs other than the Flemish ones still do not apply for the Flemish quota. After all, what has not changed is the article in the Electricity Decree stating the Flemish government could decide to accept TGCs for green power produced outside the Flemish region.[4] Consequently, as long as the Flemish government does not vote a decree in which the acceptance of other TGCs is settled, only the Flemish ones remain accepted [21]. This discussion clearly illustrates the increasing demand for integration in Belgium. A first accomplishment in this matter is acceptance of Walloon TGCs for the Brussels quota obligation since May 2005 [31].

Also on the European level a common framework for RES support is aspired. However, it should be noted that such a European-wide support scheme could be subverted by production targets per Member State, preventing the market from working in a cost-effective manner. TGCs are a market-based cost-efficient means to stimulate electricity production from RES. Expanding the borders of a TGC system results in more stable prices and a higher cost-effectiveness. However, while integrating existing different TGC systems, any remaining differences should be carefully considered. Just how difficult the creation of an international TGC market would be was illustrated by the case of Belgium, where 4 different TGC systems exist nowadays. The example of Belgium illustrates that this is easier said than done and that harmonizing TGC systems represents a serious challenge.

Acknowledgments

The authors gratefully acknowledge the support and comments received from Michel Ceusters (Elia), Thierry Van Craenenbroeck and Dirk Van Evercooren (VREG), Jean-Louis Buysse (CWaPE), Achim Woyte (3E) and Guido Pepermans (Faculty of Economics, KULeuven). The views and ideas expressed in this article only represent the personal opinions and views of the authors and by no means commit the VREG. The conclusions and remaining errors remain the authors' responsibility.

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[31] Ministerial decision of the Brussels Minister for energy. Ministerieel besluit van 3 mei 2005 houdende erkenning van Waalse groenestroomcertificaten ten einde in rekening te worden gebracht voor de naleving van de verplichting opgelegd aan de leveranciers in het Brussels Hoofdstedelijk Gewest bij artikel 28, § 2, van de elektriciteitsordonnantie. (Belgian law gazette 17/05/2005), 2005 [in Dutch or French].